THE HISTORY OF AIR POLLUTION AND ITS FUTURE

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ИСТОРИЯ ЗАГРЯЗНЕНИЯ ВОЗДУХА И ЕЕ БУДУЩЕЕ

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The history of air pollution originates in the XIII century, when in London fossil coal began to be used by artisans and craftsmen; it continues through the main events of the first and the second industrial revolution that led to great benefits for mankind but entailed an increasing consumption of coal, dissemination of air pollutants and degradation of the environment. The situation became more alarming in many countries after the Second World War, as a consequence of industrial development, rapid urban sprawl and new unexpected environmental phenomena that occurred in the sixties and the seventies. Today, an integrated approach and renewed awareness of this troubled history will be needed to face the environmental issues as a whole, with a reconsideration of some models of development that are strongly affecting our society, in the attempt to retrieve harmonious relationships that have been lost in many aspects of life.

Keywords: air pollution, energy, coal.

История загрязнения воздуха берет свое начало с XIII века, когда в Лондоне ископаемый уголь стал использоваться ремесленниками и домовладельцами; она продолжается через основные достижения первой и второй промышленной революции, которые привели к большим благам для человечества, но повлекли за собой увеличение потребления угля, распространение загрязнителей воздуха и деградацию окружающей среды. Ситуация стала более тревожной во многих странах после Второй мировой войны в результате промышленного развития, быстрого разрастания городов и новых неожиданных экологических явлений, которые произошли в шестидесятые и семидесятые годы. Сегодня комплексный подход и обновленная осведомленность об истории загрязнения окружающей воздушной среды будут необходимы для решения экологических проблем в целом с пересмотром некоторых моделей развития, которые сильно влияют на наше общество, в попытке восстановить гармоничные отношения, которые были утрачены во многих аспектах жизни.

Ключевые слова: загрязнение воздуха, энергетика, уголь.

The Prologue

In the first part of the XIII Century, London became the preferred destination of migrants escaping from the poor English countryside, as well as from the European continent. The unusual influx of people caused trouble to the economy and the environment[1].

The impact on the economy was the result of the increasing demand for timber, needed to build riverboats and houses, to supply heat for brick-burning and lime — burning, for soap, salt and beer-boiling, for metal smelting and glass melting. Wood, a common and cheap commercial good, essential for a variety of purposes and the only available energy source at the time, became increasingly expensive. In this contest, a type of fossil coal, named «black rock», coming from a mine in Wales, was launched on the market as a fuel that could replace wood and charcoal. It soon earned the appreciation of artisans and craftsmen, both for its better quality and lower cost with respect to traditional materials.

Very soon after its appearance, coal began threating the environment due to its content of sulphur, which was abundantly released into the atmosphere during combustion in the form of sulphur oxides. However, the general complaint of the Londoners, who perceived the presence of a pungent and irritating gas in the air, they breathed, did not persuaded craftsmen to give up coal, nor did it compel the King Henry III to take a measure against it. As a matter of fact, the King was dedicated at the time to renovating the old Westminster Abbey, so coal was a godsend that allowed

[1] An extended history of environmental issues is given in the author's book Storia e prospettive della politica ambientale, Kimerik Editore, Patti (Italy), 2017.

him to save on the oak brushwood otherwise required to produce the lime used as mortar.

The next king in line to the throne, Edward I, took the issue more seriously. Unlike his father, in 1272 he replied to the complaints of the subjects by issuing an edict that banished the use of coal and established torture or execution as the punishment for those who would not obey. Chronicles tell us of one blacksmith who was arrested, condemned and hanged, upon charges of having burned coal in the city of London. Since the verdict was perceived as disproportionately harsh by much of the public, the King became afterwards more indulgent, and the edict was no more respected.

The use of coal spread as wildfire in England and in Europe, together with the unhealthy air it produced and the ensuing degradation of the cities. Through peacetime and wartime, during large migrations and recurring plagues, air pollution cyclically came back as a relevant issue of the times.

In 1492, the discover of America set the context for a boost in ship-building, and the consumption of timber increased accordingly, to the point that the Queen Elisabeth, in 1558, issued an edict to prohibit cutting trees within 40 miles from both the waterfront and the navigable rivers. During Elizabeth's reign, several other edicts were issued in different circumstances to regulate the use of the wood or the coal, always without concrete results.

The First Industrial Revolution

The year 1750 marks conventionally the shift to the industrial age, but the real revolution was brought be James Watt, who improved, with a great economy of fuel, the existing Newcomen's steam engine, and in 1769 made it suitable and attractive for many applications. However, is Richard Arkwright who is recognised as the «founder of the factory age». In 1781, he applied Watt's engine to a cotton mill in Manchester, allowing it to spin hundreds of cotton threads simultaneously. The innovation paved the way for the rapid industrialisation of the textile manufactures. But two advances were still needed for the process to take off: the availability of large amount of flax, hemp and wool to allow for mass production, and faster ways to bleach and dye textile yarns and fabrics.

To fulfil the need for more textile fibres, deforestation began once again to free lands for the cultivation of flax and hemp, and for sheep-grazing to produce wool. Treatments for the bleaching of yarns and fabrics played an essential role, because organic colouring matters and inorganic materials (naturally attached to fibres and not removable by washing) tented to give a dingy look to the fabrics and had to be stripped away. Pre-industrial treatments were usually made with an alkaline lye and with an acid sour [1]; the alkaline lye was water leached from ashes of burning plants, preferably seaweeds, while the acid sour was buttermilk or carb-apple juice. A weak alkali action was exerted also by stale urine, and cow-dung or oak-gall were used as mordents, before colouring. To obtain a good result, alkaline and acid treatments had to be repeated many times in alternation, and each time the yarn or the fabric had to be dried by exposing it to the sun in outdoor. The complete operation could last several weeks. Furthermore, those procedures produced detestable stench and sickness, which is the reason why they were always located outside the urban areas.

That should be enough to understand why it would have not been possible to industrialize the textile manufactures without new techniques of textile treatment.

Somebody observed that the action of the unpleasant, organic acidic substances could be replaced by a dilute sulfuric acid that would be effective in few hours instead then in several weeks. Unfortunately, sulfuric acid was almost unknown except in some laboratories. Moreover, it was produced in rather small glass vessels (40?50 gallons), and that kind of reactor was not suitable for a large production of sulfuric acid. Only in 1746 John Roebuck (a doctor with interest in chemistry) and Samuel Garbett (an aristocrat merchant), who run a chemical laboratory in Birmingham, invented a new reactor consisting in a wooden chamber with its internal walls coated with protective lead foil. There were no special restrictions to the dimension of the lead chamber, hence it could have also been suitable for large production of sulfuric acid. The process was soon adopted, even though it was very polluting. It took about a century to reduce the emissions to a level that was acceptable for the time being, at least up to 1859, when John Glover introduced an additional absorption column that completed the new sulphuric acid four-step technology: roasting furnace, Glover tower, lead chambers, Gay-Lussac tower [2].

The alkaline action on textile fibres, in its turn, was due to the sodium carbonate and potassium carbonate, substances naturally occurring in the ashes of burning plants. A process to produce sodium carbonate on a large scale was patented in France in 1791 by Nicolas Leblanc [3]. The first step of the process was a reaction of salt (NaCl) with sulfuric acid (Na_2SO_4) to yield sodium sulphate (Na_2SO_4) and hydrogen chloride (HCl). It should be noted that, at this time in history, HCl was always released into the atmosphere, because no method to trap it was known, resulting in extended and serious damages to the surrounding area. In 1836 William Gossage, a soap entrepreneur from Widnes (Lancashire), patented a special tower that was able to extract up to 80% of the HCl conveyed in the flue gas by water absorption. Gossage allowed for his discovery to be exploited freely, without asking for royalties, but several installations continued to pollute and damage the environment.

To commit the whole alkali industry at the national level to abate HCl emissions, in 1863 the first law of the industrial age was issued, the Alkali Act, which required at least a 95% efficiency. The type of legal instrument, which binds industrialists to meet specific technical requirements, is now known as «command and control».

In a revised Alkali Act (1874), the new concept was adopted that all scheduled industrial works should employ the «best practicable means» to prevent the escape of noxious or offensive gases from any equipment used in any process. The «command and control» instrument and the «best practicable means» concept are still now two pillar of environmental policy all over the world.

It is important to emphasize that sulfuric acid and sodium carbonate were the first chemical processes that paved the way not only to the industrialization of textile manufactures but also to the development of chemical industry, and consequently to the spread of a huge number of new products and new pollutants. One more chemical process, the distillation of coal, had been experienced with in 1709 by Abraham Darby, who tried to remove sulphur from coal with the same old process used to obtain charcoal from wood but, unexpectedly, obtained a hard and porous product that was named coke. From the same process, a fuel gas would escape and dissipate into the atmosphere (since no way to trap it was known). The way to storage that gas was found, in 1792, by William Murdock, apprentice to James Watt, who invented the gasometer. The new trappable gas was soon used to light factories and streets in London. It goes without saying that as coal consumption increased, so did the air pollution.

The Second Industrial Revolution

The birth date of the second industrial revolution, conventionally, is June 14, 1830, when George Stephenson, known as Father of the Railway, drove his locomotive (the Arrow) for its maiden voyage on the first railway section connecting Manchester (the main area of textile manufacturing in Great Britain), with Liverpool (the main harbour for shipping goods, even overseas) [4]. This event opened the way to the rail transport and in about a fourth of century almost ten thousand kilometres of railway had settled in England, while consumption of coal was growing, and air pollution was extending over large uncontaminated territories.

The opening of the Suez passage, in 1869, provided a new opportunity of development for the shipbuilding industry, that led to more consumption of timber and coal, and to more territories exposed to air pollution.

In 1879, Thomas Edison obtained a patent for an electric lamp, which was a modified version, more reliable and tradable, of the lamp invented the year before by Wilson Joseph Swan. In 1882, Edison build, in London, the first thermoelectric power station, the Holborn Viaduct, to light the road running from Newgate Street to Hatton Garden, having installed two filament bulbs in each of the exiting gas lamps. With the dissemination of the new light system along the streets, in the fabrics and in the houses, the number of power plants increased, along with the consumption of coal and the air pollution of the cities.

Post-Second World War

At the end of the Second World War, a sudden recovery of industrial activities, together with the rapid urban grow, brought up all kind of environmental problems: air pollution, waste-water disposal, solid waste, abandoned landfills, eutrophication, desertification, soil erosion. The new scenario, common to many countries, involved a threat for human life, water resources, agriculture, foodstuffs, forests' survival, fishery and ecosystems.

In 1947, the Soviet Union established five classes of unhealthy industrial works which should have to be located at some sanitary protection distances from the populated areas. But the measure, already in force in some other countries, was not such as would solve the air pollution problem[2]. This problem was faced more directly in 1951 with the so-called «air quality management» approach, which was completely different from the abovementioned «best practicable means» approach of the UK. The new Russian thinking was that limitations to the industrial plants had to be enforced only when the presence of defined pollutants in the air had overcome specified maximum permissible concentrations. In fact, the Soviet Union was the first nation that set the air quality standards for ten pollutants, namely: sulphur dioxide, hydrogen sulphide, carbon bisulfide, carbon monoxide, nitrogen oxides, chloride, mercury, lead, dust and soot [5]. Of course, the need to document polluted situations implied the presence of an air monitoring network, equipped with appropriate and reliable instruments, which in fact were not available yet. Therefore, the effort to face air pollution with the new approach practically did not improve by much the situation. It just encouraged the use of high stacks to reduce the ground-level concentrations of the main pollutants, and the relocation of the industrial works away from the urban areas. Governmental action became more resolute in 1973, in the days of the first energy crisis. Citizens were pushed, through the daily newspaper Pravda, to promote reforestation, to recover wastes, to save energy, and contribute to reduce the air pollution in the cities, due particularly to the carbon monoxide, that in Moscow surpassed by twenty times the air-quality standard [5].

In China, things went different. Mao Zedong, already in 1949, started tackling the environment problems as part of the Cultural Revolution. By exalting the patriotic spirit and the ethics of frugality, he forced intellectuals and students to reclaim lands and re-use the four kinds of wastes: waste materials, waste water, industrial tail gases and waste heat. China had hygienic problems

[2] Frederick II, King of Sicily, in 1231, ordered that some unhealthy professions must only be practiced in the suburbs. The same principle was adopted through a decree by Napoleon in 1810, and after then in Germany (1869), Italy (1888) and France (1917).

rather than conventional pollution problems, since only 15 % of the population leaved in urban areas, and motor traffic was practically non-existent. Mao's were commendable: relocation of the small activities into the suburbs, green belts around factories, limitation to the expansion of cities, the recovering and re-using of any kind of waste. However, all these efforts were frustrated by some political and ideological measures: birth control, a flattening out of technical knowledge, the breakup of universities, xenophobia and the ensuring segregation from the international context, which produced a delay in the acquisition of new technologies and in the preparation of specialized technicians [6].

The sixties were the time for many industrialized countries to establish measures to face the environmental problems, which appeared as a consequence of the process of economic development rather than of specific political circumstances. The first measures addressed to fight the air pollution were adopted in France and Israel (1961), United States (1963), Belgium and Federal Republic of Germany (1964), South Africa and Yugoslavia (1965), Poland and Italy (1966), Czechoslovakia (1967), Sweden and Japan (1969), The Netherlands (1970), and in several other countries in the following years [7]. Countries under the influence of the U.S.S.R. adopted the «air quality management» approach, while most of the others (except Great Britain) addressed the problem on both sides: air quality and emission standards.

The Environmental Pandora's Box

In the seventies, several new and unexpected environmental challenges came up as from an environmental Pandora's box, thus far unopened.

The first great problem, highlighted in the sixties but that became worrying in the seventies, was the acid rain that was threatening forests and lakes in the northern part of Europa, from Germany to the Scandinavian and Eastern countries. The phenomenon was caused by the acid emissions released from the tall chimneys of power plants, able to travel for hundreds of kilometres before falling to the ground through wash-out or rain-out phenomena[2]. That was the first case of trans-boundary air pollution, which involved several countries and revealed the need of an international cooperation to adopt shared and coherent measures, to match the transnational aspects of the air pollution.

In 1974, a new alert was raised by two chemists, Mario Molina e Frank Sherwood Rowland, Professors at the University of California [8]. They had experienced in the laboratory that some widely commercialised gases, the chlorofluoromethanes, were no toxic for the human being but were both chemically very stable (with more than a century-long lifetime) and able to spread everywhere in the atmosphere, reaching the stratosphere. There, solar ultraviolet radiation could break the molecules and free their chlorine atoms which, combined with ozone, would form oxygen. In the atmosphere layer between 15 and 50 kilometres from the ground, the ozone concentration is naturally high, and is essential to intercept ultraviolet radiation from the sun, protecting the Earth. Therefore, the depletion of the ozone layer by chlorofluoromethanes, as in a catalysed chain reaction, could have caused serious consequences for the planet. The findings of Molina and Rowland were confirmed by several experiments, and the two researchers were awarded of the Nobel Prize for Chemistry in 1995.

While the ozone of the stratosphere, protective for the planet, was depleted, in the troposphere ozone was being produced, with harmful consequences for men, vegetation and climate. This was part of a new phenomenon known as photochemical pollution, which had been observed for the first time in Los Angeles in 1943. It appeared to be an unknown form of smog, emerging in sunny and hot days with a low humidity level, in contrast to the London smog, typical of winter time and of cold days with a high humidity level. The explanation of the phenomenon was given, some years later, by Arie Jan Haagen-Smit, a Dutch professor of biochemistry at the California Technology Institute. In the troposphere, a photolysis of the nitrogen dioxide, due to solar radiation, takes place forming nitrogen oxide and freeing oxygen atoms that, in their turn, activate a chain of reactions with the volatile organic compounds and the carbon monoxide to produce ozone, peroxyacetyl nitrate, aldehyde, and many other organic compounds. In the early days, photochemical pollution (named «haze») in the Los Angeles region was regarded as a local phenomenon, that could only have arisen in such an extended urban area in that geographical position with such a rapid industrial growth. In the seventies, however, haze was observed also in Europe, above all in the Mediterranean region, as the use of coal was being reduced and the presence of volatile organic compounds in the air was growing.

In the seventies, another phenomenon emerged from the Mauna Loa Observatory: the concentration of the carbon dioxide in the atmosphere was increasing. Jean Baptiste Joseph Fourier firstly, and Svante August Arrhenius (the latter, Nobel Prize for Chemistry in 1903), had explained that some gases, in particular CO_2 and water vapour, create a «greenhouse» effect that makes life possible on the Earth, maintaining the average temperature around 15°C [9] [10]. However, an increased concentration due to anthropogenic sources could have generated a climatic change on the planet with unpredictable consequences.

The seventies were also the decade when some commercial products were discovered to be toxic for human

[2] The removal of acid substances from the atmosphere may occur within the cold system («rain out») or through the washing effect during rain («wash-out»). Both effects ultimately convey the acidy to the ground — the former at longer distances from the source, the last much closer by.

beings and/or carcinogenic, as the polychlorinated biphenyls (PCB's), the dichlorodiphenyltrichloroethane (DDT), asbestos, benzene, some Persistent Organic Compounds, black-carbon and the lead tetraethyl added to gasoline as antiknock.

At international level, the seventies began with the first Environmental World Conference in Stockholm (1970—1972) to end, in 1979, with the Convention on Long-Range Transboundary Air Pollution (CLTRAP), the first international agreement approved in Geneva by 34 countries, under the UNECE auspices. Several more international agreements were signed in the following decades, among which the most important were those linked to the phenomena described above: the Montreal Protocol on Substances that Deplete the Ozone Layer (1987), the Intergovernmental Panel on Climate Change (1988), the Volatile Organic Compounds Protocol (1991), the Kyoto Protocol (1997), the Persistent Organic Compounds Protocol (1998).

At the national level, in the seventies, there were attempts on the part of institutions to find more appropriate political tools to deal with the new, pressing environmental problems.

On January 1st, 1970, in USA was enforced the National Environmental Policy Act, with the purpose to evaluate in advance the eventual impact on the environment of any policy plan or decision-making process, and to integrate technical planning with the social and natural sciences, together with the economic implications in a long-term perspective.

In France, in 1971, an ad hoc Department for the Protection of the Nature and the Environment was established, which had no equivalents in other countries. This was the result of an eco-centric vision of the planet that was replacing the traditional, anthropocentric vision.

The political tool of the «command and control» did not always prove adequate to reducing human impact on the environment. In addition, an «environmental taxation» was therefore adopted for some specific activities and products, charging those particularly polluting, and consequently shackling their trade, or promoting those with a low impact on the environment, which had to be evaluated along their life cycle, from cradle-to-grave. «Environmental taxation» was a way to apply the polluter-pays principle first proposed by Arthur Cecil Pigou, professor of political economy at the University of Cambridge, at the beginning of the XX century.

To reduce the impact on the environment, more political tools, voluntary and oriented to leverage the market, have been adopted over time, at least within the European Union: Ecolabel, EMAS (Eco-Management and Audit Scheme), Integrated Product Policy, Green Public Procurement, Emission trading.

The Energy

Energy drives the economy and the development of society. In the XIII Century, the coal was welcomed in London to replace the wood, but in a short time the city experienced blurred skies and the degraded air quality as had never been seen before. A similar fate was met by large cities in Europe, and everywhere the situation kept getting worse in the following centuries. In the seventies, only after seven centuries, some industrialized countries started reducing the use of coal. But it still fulfils a large part of the world's energy demand. Nowadays, under the Kyoto protocol agreement, EU countries are committed to phase the coal out within the year 2030. As a matter of fact, the Word Energy Outlook 2016 predicts a growing demand of primary energy, from 13,7 Gtoe[4] in 2014 to 16,6 Gtoe in 2030, and of coal as well.

After 1859, when the first oil well was drilled in Titusville (Pennsylvania), crude-oil was praised as an environmental panacea, a fuel that would replace coal and thus clear the skies of our cities from the oppressive black smog. Not only that, but gasoline was going to promote the dissemination of motor cars that would discourage the use of animal-pulled carts and thus clean up the streets from dung. It took some time to understand that oil and gasoline were themselves sources of polluting chemical substances, less visible and more deceptive. The phase-out of crude-oil may concern the electric energy production or petrol-powered cars, but not the petrochemical industry.

After the Second World War, high expectations were placed on the peaceful use of nuclear energy (which could replace coal and crude-oil) since it did not release any conventional polluting substance. However, a few tragic events (Three-Mile Island in 1979 and Chernobyl in 1986) were enough to warn against the new power source, since an accidental release of radioactive gases could diffuse at long distances, remaining active for centuries and harming much more than conventional pollutants. After the 2011 Fukushima event, several countries have announced the intention to phase-out their nuclear power plants, but it will be not an easy step and certainly will take time. In 2016, 442 nuclear power plants were in service with an overall 380 GW[5] power and 66 were in construction for an additional 65 GW power.

In the seventies, the methane was advertised as the new panacea, a better and most affordable solution that could largely replace the old poisons — coal, crude-oil and nuclear energy. Unfortunately, methane combustion releases air pollutants as well, even if to a lesser extent than coal and oil, and itself exhibits a greenhouse effect. No phase-out is expected for methane which, on the contrary, in some countries could remain the only fossil fuel able to

[4] Gtoe stand for Gigatons of oil-equivalent.
[5] GW stand for Gigawatt.

guarantee the energy supply in any circumstances, especially when the renewable sources may not be sufficient.

Today, many potential benefits are being expected from renewable energy sources, mainly from wind turbines and photovoltaic cells. However, their side effects are seldom adequately discussed: the need for powerful energy-storage systems (since their production is variable and unpredictable); the fact that hundreds of thousand installations are needed to supply the same energy now produced by few conventional thermal power stations; the tens of thousands square kilometres needed to locate those plants at compulsory distances from each other; the soil consumption; and the landscape blight.

Even neglecting those problems, the main risk coming from renewable sources may lie in the practical and political consequences of a forthcoming shortage in some strategic raw materials needed to run those technologies — materials that are now in the hands of very few countries — like neodymium and dysprosium (essential for the electromagnets in the wind turbines) or copper indium selenide, germanium and cadmium tellurium (useful for the thin-films of photovoltaic cells).

The Future

The history of air pollution began with the use of fossil coal in London, in the XIII century. Ostensibly, this was a response to the growing demand of consumer goods and heat production. The root cause, however, was the poverty of the unproductive rural area, which forced people to migrate toward larger cities in search of food, job, services and places to live a better life. The British kings were the first policy-maker ever who had to face the ensuing challenges, and proved unequal to the task.

Nowadays, it seems that there is nothing new under the sun. At least, this is what one part of public opinion believes about the environmental issue. Another part of the public, instead, looks only at positive aspects of daily life (the increased lifetime expectancy; smaller infant mortality rate; reduced epidemics; better education; healthier living environment) and others worry about negative aspects (shortage of water, food, and natural resources; deforestation, desertification, loss of biodiversity; dissemination of toxic chemicals, greenhouse effect).

All these viewpoints — unresponsive, optimistic or pessimistic — are based on objective motivations, but are incomplete, and the environmental issue is a challenge that may be faced only with an integrated approach. It must be recognised, first, that the real news under the sun are not the environmental problems in themselves, but their temporal and spatial scales.

Many decades will be needed to recover completely the ozone hole, while one century should be not enough to lower the carbon dioxide concentration in the atmosphere down at the pre-industrial level, since all the efforts designed by the Kyoto protocol aim to hold the increasing average ground level temperature of the planet within two degrees.

In the late '60s and early '70s, part of the North Europe was exposed to the acid-rain phenomenon, and it took about forty years to reduce it to a reasonable level. Nowadays, a region much more extended along the north subtropical zone is affected by a similar high pollution level. How long will it take to clean that region?

In addition to the temporal and spatial scales, the environmental problem is exacerbated by the grow of the world's population toward nine billion, by more than a billion of a poor people that avail themselves only of wood and dung as heat sources, by tens of millions of uncontrolled migrants converging toward wealthier areas every year. The demand for food, water, commercial goods and energy increases, together with solid waste and the shortage of potable water; the urban sprawl of the megacities is accompanied by a high level of air pollution; the eutrophication, deforestation and desertification degrade the environment, and the inability of the governments to manage all those problems remains.

The environmental issues are also getting harder because of the huge number of international conventions and protocols, European directives, laws and regulations at national and local level, that have produced a high fragmentation of objectives and professional skills together with a plethora of stakeholders, which goes in the opposite direction with respect to an integrated environmental policy.

It looks like a bundle that had tangled up over time and now nobody is able to unravel. It cannot be solved through indifference, nor by facing the different aspects one at a time, or by laying all the blame on the variously defined spectre of climate change. The cure may not require destroying capitalism or restoring primitive autarky or going back to a peasant life. However, some developing models, which strongly affect our society, should be reassessed.

First and foremost, the global market needs to be reviewed. It supports, and is supported by, the largest financial, industrial and commercial companies with the sole view of getting constantly bigger, competing against each other with little substantial regard for the environment (and for social inequalities and job insecurities as well). The ruling financial model prefers to risk in the short run; the ruling industrial model encourages the delocalisation of work in countries with a permissive attitude towards environmental impact; the ruling commercial model promotes an ever-greater demand for energy and transport. The global market weakens, stifles and destroys small enterprises, craft trade, agriculture, local culture, the social life of the small communities and their network of human relationships.

From the environmental point of view, the global market is causing an increasing degree of wastes, air pollution, greenhouse gas emissions, and environment degradation. From the social point of view, it forces the

population to move into boundless megacities, to look for job, health care, instruction or services. The remaining areas are exploited till they are worthwhile, then forgotten and abandoned. The global market, as it is, respect neither the polluter-pays principle, nor the sustainable development principle.

Mass media play a key role. A current attitude consists in exacerbating the climate change issue while, on the other side, reassuring us that the wind and the sun will provide easy energy forever, that recycling will solve the waste problem, that circular economy will prevent the shortage of raw materials, that electric cars will clean the air in the megacities, that sustainable development will be achieved by sticking the prefix «eco» and «bio» to the largest number of marketable products, that the green economy will create job and the global market will create wealth.

It would be more appropriate for mass-media to convey the hard true that there are no trivial or win-win solutions. Discoveries and innovations have brought great benefits to the mankind, but always by having some impact on the environment. The impact, at the global level, has been continuously increasing.

Just as importantly, it would be desirable to retrieve harmonious relationships that have been lost in several aspects of the life — between Man and Nature, town and country, prosperity and poverty, local and global market, national and transnational governments, institutions and non-governmental associations. It must be borne in mind that environmental problems may arise both from development and prosperity or from underdevelopment and poverty. The most urgent of our current needs is to reduce these gaps.

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